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DR. B. WOOD'S

PLASTIC METALLIC FILLING.

EMBRACED IN LETTERS PATENT GRANTED MARCH 20, 1860

PATENT FOR THE IMPROVEMENT ALLOWED.

Many inquiries are addressed to me in reference to the nature and advantages of the Plastic Metallic Filling, its origin, the manner of using it, the opinion of dental practitioners in regard to it, &c., &c. To economise time I have thought best to issue this Circular, in which I have endeavored to cover, as concisely as possible, the essential points, proposing hereafter to treat the subject in its various connections and bearings more at full. The general qualities and advantages of the material may be briefly cited.

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26994
Washington D.C.
ITS QUALITIES AND ADVANTAGES.

The Plastic Metallic Filling is designed for making perfect and durable plugs, as a substitute for gold where economy is an object, and for inferior material where the teeth can be saved, and not for temporarily stopping up those which are diseased and worthless. It is therefore assumed that the dental cavity be previously well prepared, and the entire operation be skilfully executed with a view to saving the tooth permanently. There is no preservative quality in any material employed, considered in itself, whatever may have been imagined or claimed to the contrary, its value depending upon its successful manipulation, and its susceptibility of forming a secure, impermeable and durable filling. It is *good work* that saves the teeth, and, other things being equal, that with which the *best work* can be done is the best material for the purpose.

Assuming, then, that it be skilfully used, the Plastic Metallic Filling possesses advantages above every other material but gold for filling teeth, while it can be successfully employed in many cases where gold cannot. It can be introduced



with facility and accurately secured. It moulds closely to the walls of the cavity without recession or shrinkage, forming a perfect plug, solid throughout, that effectually excludes air and moisture. The proportions are adjusted so that it shall expand very slightly rather than contract, upon solidification, sufficient to make a close fit, but not enough to injure the frailest shell of a tooth. It can be built out from broken and defective teeth, so as to restore their original form and usefulness. In this way entire crowns have been restored for the support of clasps as well as for use in mastication. In such cases, should the cusps or points become abraded by continued wear, as any material may, they can be readily built out again, whereas when gold foil or sponge gold chips out or wears off under like circumstances, it is difficult, if not impractical of renewal.

The metal is of close, compact texture, like solid tin or gold, and cannot absorb the buccal secretions, as do the earthy and metallic pastes, and also gold and tin foils when not well condensed; it therefore does not, like these become tainted and offensive, but remains absolutely free from any interstitial impurity.

At a temperature but little higher than that of ordinary hot drinks, and yet not low enough to be affected by them, it is rendered soft and plastic, suitable for application, while at a heat liable to do harm, it becomes too fluid to work; by this it is self-gauged and within control,—being its own thermoscope. Operations with it are generally more expeditiously performed, and attended with less discomfort than with gold; in cases of highly sensitive dentine the pain is far less than that produced by removing the decay and but momentary; but in ordinary cases there is no pain at all experienced in introducing it. As it solidifies upon introduction, it is of immediate service for mastication, and not liable like amalgams and other cements, to wear off or to crumble out.

It contains no mercury, nor is it allied in composition or qualities to amalgams,* and it is free from their objections. Neither can it blacken the tooth-bone as these preparations are necessarily liable to do. The amalgam employed for stopping teeth, (commonly called "cement," or "silver cement,") is composed of an alloy of silver with one or two parts tin, or one-tenth part copper (coin,) generally both, for pure silver does not harden well, and therefore is not used, which alloy is reduced to fillings, and mixed up with mercury (quicksilver,) into a paste for introduction into the tooth cavities, where it hardens after a while. But mercury is a fluid capable of permeating any tissue; it is also volatile and slowly vaporizes at any temperature; and as it has but a feeble affinity for the other metals in the compound, the particles of which it serves to agglutinate, it gradually eliminates itself in part, permeating the tubular structure of the tooth which it blackens; for its particles finely comminuted are dark, and this is intensified if oxidated or combined with sulphur. This also leaves the plug porous to imbibe impurities.

The constituents of the Plastic Metallic Filling are, on the contrary, all permanently solid. The metal can undergo no change or loss of substance, except what might occur from the surface. It therefore does not, nor indeed can it

* The word *Amalgam* denotes, a *combination of Mercury with another metal*.

affect the tooth structure; nor discolor the contiguous portions of the dentine when the plug is perfect, so as to preclude impurities working underneath. If however the work be defective and decay go on it may induce oxidation. The decayed matter of a tooth is the most corrosive of agents upon metals. It will oxidate any of the base metals. Even gold itself is in some instances eroded by it, as evinced by the purple stain communicated to the dentine where decay goes on in contiguity with gold plugs; and it is not to be presumed that a composition of the baser metals, as tin, cadmium and bismuth, would remain unaffected when any one of them separately would not; for there is no process of *compounding* by which metals can be transmuted into gold, as the alchemists of old idly imagined. When oxidation thus takes place, the decay, of course, will be stained according to the color of the oxide or salt which acts as the pigment, from gold, purple, "silver cement," inky black, the Plastic Metallic Filling, light orange, etc.

But assuming the work to be thorough, as it should be whatever material be employed, and without which nothing will be effective for the permanent preservation of teeth, the Filling retains its color, and since this is silver-white, it does not darken the tooth, even when so thin as to show through; hence it is suitable for front teeth as well as back; whereas tin in such cases reveals a darker shade, amalgam shows through black, and gold itself is less objectionable only so far as its yellow hue corresponds more nearly to the color of the tooth.

As it requires no force for its introduction it can be safely used in frail teeth, and the teeth of children &c., where pressure would do injury.

It is the best non-conductor of any metallic substance employed, the advantage of which is obvious especially in teeth, sensitive to transitions of heat and cold.

In hardness it is nearly equal to pure gold cast solid, and will out wear gold plugs imperfectly consolidated, as well as tin plugs however perfect.

It is inferior to gold in being more liable to tarnish in certain conditions of the mouth, but is found superior in this respect to other metals used for the purpose. It is readily acted upon by nitro-muriatic acid, which dissolves gold and platinum, and also by nitric acid which dissolves silver and all the inferior metals, but resists other acids and agencies to which it is subjected in the mouth, as well or better than silver. This appears due to the large preponderance of bismuth in the compound, a metal which deserves a place among the "precious metals" equal with silver, and but for its brittleness and softness when uncompounded, would rank above it, and which (freed of course from the contaminations incident to it in the crude state, as obtained in commerce) could it be worked in the form of foil like gold, would in the main essentials doubtless prove more suitable for the purpose than even the latter metal.

The Plastic Metallic Filling withstands any acid the tooth structure can, and will out last the teeth under any agency by which they are both liable to be affected. Placing a tooth plugged with it in diluted hydrochloric acid, (the most destructive acid to which the natural teeth are liable to be subjected, and which under certain conditions is present in the mouth in a very diluted form,) upon examination

after three weeks, the tooth bone was softened like cartilage, and the enamel reduced to an incoherent pulpy powder, while the filling was not eroded away in the least, and although it was darkened on the surface by incipient oxidation, this was a mere pellicle, a light scratch revealing the metal perfectly intact and bright underneath. Sulphuric acid exhibited a similar result.

Of the various substitutes for gold resorted to, tin has heretofore been considered the best, because generally found to resist the morbid secretions eliminated in the mouth better than the others; and it would have been more generally used instead of amalgam, oxichloride of zinc, or "bone filling," and other inferior stopping, but that its introduction involved more skill and trouble. But tested (by a disinterested observer) in comparison with the Plastic Metallic Filling, in mouths where the secretions were peculiar corrosive on oxidable metals, at the end of a year the tin was found black and soft, from oxidation, to some depth, while the Plastic Metallic Filling exhibited only a superficial tarnish. Even where the Filling is subjected to galvanic action in the mouth, in contact with gold, as in supporting a clasp, the oxidation is confined to the surface, forming a thin film, which appears to effectually prevent further action. Under ordinary conditions, however, it remains bright, or exhibits only a dull white opacity, hardly amounting to a change of color, in striking contrast to the dark, dingy hue of poorly condensed gold plugs that have become soiled by the imbibition of impurities, and which had far better be replaced with this Filling, for appearance sake as well as utility.

In short, dentists, once skilled in the use of this material, find it better for the effectual preservation of teeth than any other yet employed, except gold thoroughly impacted at every point, and far superior to indifferent gold fillings.

The metal is also useful for engraving artificial crowns and partial crowns, securing ordinary pivot teeth, and for repairing plate teeth, particularly on rubber base, and may be used itself as a base for artificial sets, as well as for various purposes in the arts—silvering glass, making medallions, taking impressions of delicate forms and objects; for thermoscopic and safety guages, hermetical sealing, affixing points and ferrules, etc., etc. For purposes of the arts, however, where economy is the great desideratum, a different and much cheaper formula is prepared, and as therapeutical considerations do not here interpose, the ingredients are used as obtained in commerce, without being subjected to preliminary processes of refining and edulcoration, thereby obviating the most important item in the expense. But in this case, to prevent imposition upon the profession by unprincipled dealers, and upon the community by dishonestly penurious dentists, the metal which is prepared for the arts is stamped and sold in thicker bars, which cannot be reduced without obliterating the impress, to counterfeit which is a criminal offence, with a penalty which few will hazard. Although the best security against imposition is for the community to avoid all professing to use the Plastic Metallic Filling, or "something as good," but who cannot show themselves entitled to use it, and then no imposition will be

attempted. With this view the license system was adopted, and all licensees are duly accredited.

The qualities above mentioned render this material an object of no slight interest to the dental profession, and to these of the community who have teeth which they wish preserved in the most effectual as well as economical manner. And since some have attempted to detract from it by representing it as the old fusible metal of the books, or some mercurial compound long since discarded by the profession, and as few take the trouble of referring to the sources of information, it may not be out of place to quote from some of the first announcements in regard to the original discovery, which was the result of a systematic investigation during my residence in Nashville, Tenn.; although the improvement which gives it value for dental purposes was not produced until two years after the original patent, nor brought to its present state of perfection until since my return to my native city.

NOTICES OF THE ORIGINAL DISCOVERY.

FUSIBLE ALLOYS—SCIENTIFIC RESEARCH.

It has been announced that our fellow-citizen, Dr. B. Wood, Dentist, was recently granted a patent for a Metallic Composition, of practical value as a fusible alloy. In compliance with a request from the editor of the *U. S. Mining Journal*, the inventor wrote for that paper an article upon the subject, which we copy below, and which will be found of scientific interest and value. Dr. Wood is a laborious student, and a careful and discriminating experimenter; and we trust that he may find leisure in the future to give more liberally to the public of the results of his investigations.

Nashville Banner, June 2, 1860.

Dr. B. Wood of Nashville, has discovered a valuable alloy which fuses at 150° Fahr—a lower temperature than the fusing point of any metal previously known.

New York World, (Scientific American, Nov. 17, 1860.)

The best known alloy fusible at a very low heat. * * * * It is superior to the cheap quicksilver amalgam for filling teeth.

Scientific American, Aug. 24, 1861.

NEW "FUSIBLE METAL."

Dr. B. Wood of Nashville, Tenn., has secured a patent (Weekly Scientific Artizan, Cincinnati, May 5, 1860,) for an alloy * * * which fuses at a temperature between 150° and 160° F. The constituents of this *fusible* metal may be varied according to other desired qualities of the alloy. * * * * We have had time only to repeat a few of Dr. Wood's interesting experiments in regard to the remarkable influence which cadmium exercises in lowering the fusible point of various alloys. The alloy—melts at a temperature varying not far from 70 C., (158 F.) It may

appropriately be called "Wool's fusible metal."—*Eds. Silliman's American Journal of Science and Arts, Sept. 1860.*

WOOD'S FUSIBLE METAL.

From the London Chemical News, No. 68.

Lipowitz has made some experiments on the Cadmium-alloy described by Dr. Wood. (See *Chemical News*, vol. ii, p. 257.) It is permanently silver-white, and has a brilliant metallic lustre; it is not so brittle or hard but that it may be obtained in thin leaves or flexible plates; it has a fine grained fracture, and may be filed without stopping up the file. In dry air it keeps its polish. It expands in cooling. Its specific gravity is from 9.4 to 9.41. It softens between 131° and 140° Fahr., and near 140° becomes perfectly fluid. No change in the condition of the metallic mass was observed on remelting after rapidly cooling the alloy. The above properties show that the alloy may be applied to some useful purposes. It may supersede all the quicksilver alloys for stopping teeth. It may be used as a solder whenever the metals soldered are not likely to be exposed to heat. Tin, lead, and Britannia metal may be soldered together under water above 160° Fahr. Zinc, iron, copper and brass may also be soldered with the greatest ease under water, to which a little hydrochloric acid has been previously added. The alloy is so easily fusible that it may be melted on a piece of paper over a spirit lamp. In the preparation of the alloy, the author recommends the use of the purest bismuth—*Dingler's Polytech. Journal, Bd. clviii. s. 271 and 376; Journal of the Franklin Institute, June, 1861.*

As the fusibility of the slightly varied formulas examined by the two authors last quoted is identically the same, the difference in the figures given may be due to different modes of measurement, or possibly a print-error in the last instance; although the discrepancy is not greater than in results given by different authorities in respect to almost every other metal. Carefully repeated tests indicate 150 deg. Fahr. as the true melting point, or 62 deg. below the temperature of boiling water, and some 50 or 60 degrees below the melting point of the old fusible alloy of lead, tin, and bismuth, described in the books as Newton's or Rose's alloy, and employed to some extent for filling teeth, under the name of Darcey's metal.

But this new fusible metal, which differs essentially from the old in composition and qualities, in melting at a temperature low enough, and possessing other advantages over it for dental purposes, was still objectionable, and accordingly I did not propose it for this use until these objections were overcome by the production of an entirely new form of the metal, differing in certain essentials as widely from the first as that from the "fusible alloy" of the books.

THE IMPROVEMENT.

The general qualities of the improved and plastic form of the metal have been stated. It differs from the original in being harder and more durable, in having a better color, in being free from injurious expansion upon solidification,

and in possessing other requirements of tooth filling which the other did not. It resembles it in fusibility, but requires a little higher heat to work it than that at which the other melts, varying at the lowest from 152 to 156 deg.; but differs in being soft and *plastic*, instead of fluid, and in remaining plastic several degrees higher. This allows time for introduction into a dental cavity, and enables it to be moulded or compressed therein, and to retain its place without recession. The proportions are adjusted so as to prevent contraction as well as undue expansion on cooling in a tooth; while the component metals, as a preliminary step, are carefully purified from the pernicious contaminations incident to them in the crude state as obtained in commerce—the importance of which will be apparent.

As it has been attempted to identify this metal with the old fusible alloy before referred to, and which is the only metal which can be used in its stead without infringement upon my patents, it may be proper here to contrast the qualities of the two. The difference between them is more marked than that between some of the simple metals. It is certainly as great as that between lead and tin in almost every characteristic, and in some particulars greater. But a brief notice of the objections to the old alloy, as a material for filling teeth, will suffice. These relate

First—To its softness, being inadequate to resist wear. The Plastic Metallic Filling is a great deal harder and more durable. Take triangular bars of each, and compress the edges together under a vice, and the Filling will cut the old alloy through clean, with scarcely an indentation upon itself.

Second—Its purplish gray metallic color, giving a dark hue to the tooth where liable to show through. (The Plastic Metallic Filling is of a silver-white.)

Third—The lowest heat required for its fusion being 200 deg. to 212 deg., is inconveniently high for general use in filling teeth, and in some cases liable to do mischief; and as it is *fluid* as soon as melted, and but fluid at a much higher heat, there is no criterion of safety in using it, while the Plastic Metallic Filling becomes too *fluid* for manipulation some thirty degrees below this minimum temperature, and must be allowed to cool to this to be of the proper consistency for application.

Fourth—It passes so quickly from a fluid to a solid state and *vice versa*, that it is difficult and often impracticable of application; for the tendency to assume while fluid, a globular form, causes it, when fused into the cavity of a tooth, to recede from the walls and margins of the cavity, thereby leaving imperfections; and at the point of congelation it becomes too quickly solid and unimpressible to allow of working it down to its place. Hence it is inapplicable in the majority of cases, being confined chiefly to crown cavities of lower teeth; it cannot be well conveyed upon an instrument, but if tilted drops off. The Plastic Metallic Filling clings to the point or blade like semi-fluid wax, and can be thus carried and accurately moulded to any spot.

Fifth—It expands upon solidification to an extent which is liable to crack a frail tooth and otherwise do injury, whereas in the Plastic Metallic Filling this difficulty is overcome.

The third objection in respect to the high heat required, is removed by mixing with the alloy a certain quantity of mercury, which, being itself fluid, lowers the fusing point of the mixture in proportion to the quantity used, but when enough is added to be sufficiently fusible for the purpose, or as fusible as the Plastic Metallic Filling, it renders the compound very fragile and soft, so that the unamalgamated alloy will cut it in two, and also more susceptible to oxidation, and otherwise unfit for use; while the mercury having little chemical affinity for any of the other constituents, gradually eliminates itself, permeating the dentinal tubuli, and discoloring the tooth, the same as in the case of the amalgam pastes above referred to. Yet it is this mercurial compound which is generally resorted to. It is this which dentists mean when saying they "have used fusible metal." It is this, compounded with the crude materials bought at the shops with all their pernicious contaminations, that impostors are selling throughout the country at from fifty cents to two dollars an ounce, according to customers, and representing it as "Wood's Filling," or substantially the same,—sometimes pretending to have "*stolen the receipt*" from my books.* Some are content with enough of the Plastic Metallic Filling to be able to show its patent stamp, under color of which they can palm off a cheaper article on their patients. Am I not right in yielding to the demands of the community in the matter of requiring licenses, that all may know who are legitimately using the patent and who not?

* It is this also which, as I perceive from the last No. of the "Dental Cosmos," (April, 1864,) that Dr. J. D. White, the editor of that publication, seeks to identify with the Plastic Metallic Filling. Of the amalgam compound as formerly prepared by himself by a "series of experiments, aided by an intelligent physician," (all which might have been spared had he consulted the books,) styling it "White's Terra Metallic Compound," but which proved a failure, (as he might have known in advance from the same sources,) he says: "This metallic compound was used by heat, precisely as Dr. Wood's, and looked as much like it as possible. It was no better than amalgam, except that it contained less mercury." He then proceeds to confound the two, and, as by anticipation, to prejudice or paralyze testimony.

If Dr. J. D. White had analyzed the metal which he would condemn by implication; if he had any knowledge of Chemistry and Metallurgy, or of the characteristics of metals; if he had read any of the Scientific Journals before referred to; if he had examined the specification of my patent, which was published in full in a Scientific Journal at his door, and clearly distinguished Wood's Metal from mixtures such as he "used" in 1838 and 1839, "under the scientific name of Terra Metallic Compound;" if he had even taken pains to compare side by side the physical characters of the two, instead of speaking as at venture and from memory; and if, with these, or any one of these preliminaries, he had been actuated by a spark of fairness and justice, he would not have said that "it *looked* as much like it as possible," nor have *intimated* as strongly "as possible" that it was the same or a similar mercurial compound. He would have squarely and truthfully pointed out the difference for the information of his readers: and then in reply to the many dentists who, he says, have written him "to know what we thought of Wood's plastic filling," if he disliked it and wished to influence them against it, and had nothing else to oppose; he might have told them, as he does: "We do not find any use for plastic filling in *our* practice, because we do not use anything but gold, Hill's stopping, Oxichloride of Zinc, and tin: if we required anything else in *our* practice, we would use the old-fashioned amalgam, or its modification known as Townsends," &c.; trusting to the "great influence" of his *example!* (The Plastic Metallic Filling will get along, "without our influence.")

Dr. White does not allude to the patent, which would at once have reminded intelligent readers that the material is substantially different from that with which he would identify it, or no patent could have been obtained. He does not say it contains mercury, he dare not say that, though it is easy to determine if it did, yet he conveys, and evidently seeks to convey this impression.

It is to be regretted that a publication, which, although it be but an Advertisement Carrier for the goods and material which its proprietor manufactures and offers for sale, is still widely circulated and capable of usefulness, should be *prospered*, whether at the behest of personal pique or interest, to the humiliating business of not merely withholding important information from the profession, but studiously misleading its readers on subjects in regard to which they are most desirous of being informed.